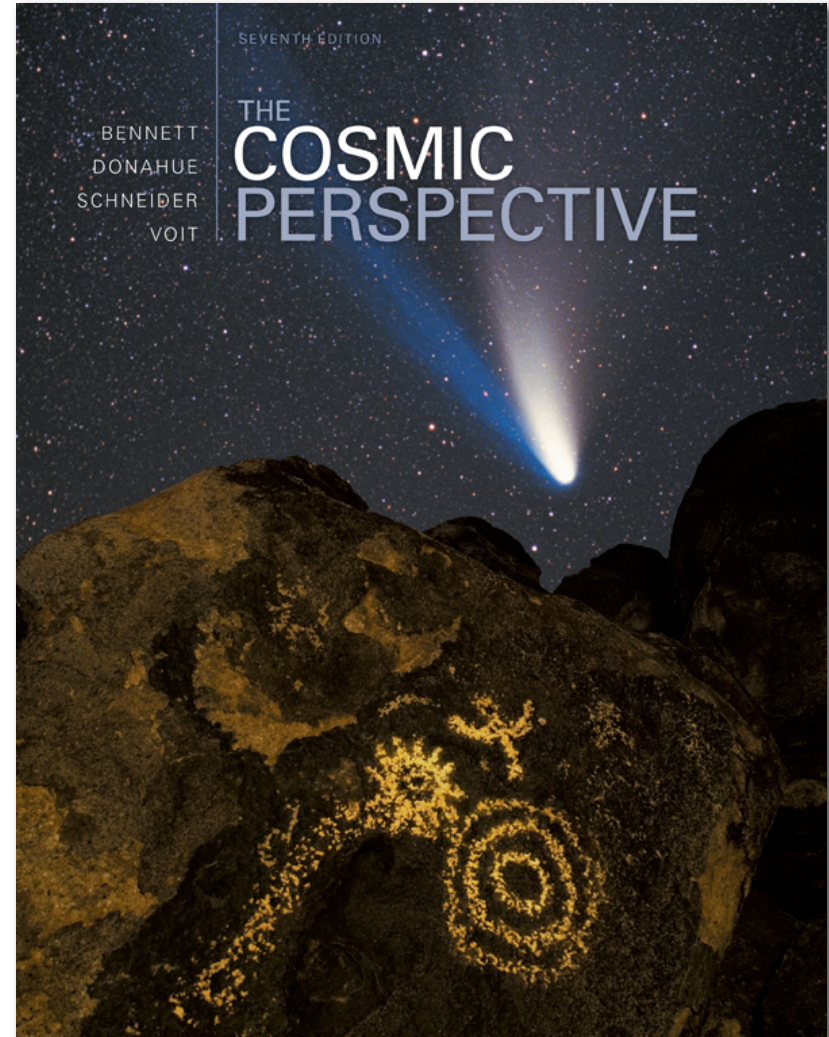


## The Cosmic Perspective

Seventh Edition

### Jovian Planet Systems



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- a) bacterium.
- b) grain of rice.
- c) marble.
- d) orange.
- e) grapefruit.

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- c) have moons, but Uranus and Neptune have only one or two.
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What is the structure of Jupiter like?

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- c) gaseous on the outside, then liquid hydrogen, more dense metallic hydrogen, rocky core
- d) gaseous on the outside, then liquid hydrogen, then helium, then the other elements



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What are the most common *elements* in the atmospheres of the jovian planets?

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Since there are a lot of flammable gases on Jupiter, such as methane and propane, if you lit a match, would Jupiter burn?

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- a) escape into space.
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Jupiter does *not* have a large metal core like Earth. How can it have a magnetic field?

- a) The magnetic field is left over from when Jupiter accreted.
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- b) are found on Jupiter.
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What's the weather usually like on Jupiter?

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Jupiter is about three times as massive as Saturn, but only slightly larger. Why?

- a) It is made of denser material.
- b) It is made of less dense material.
- c) Adding mass increases gravity and compresses gasses.
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Looking at a Jovian planet in different wavelengths of light allows us to

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What would increase the tidal heating of a moon?

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- b) a larger size
- c) a larger companion planet
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What would increase the tidal heating of a moon?

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How does the energy Jupiter radiates back to space compare to the energy from the Sun that falls on it?

- a) Jupiter gives off more than it receives.
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Titan is the only moon with a thick atmosphere,  
and its surface

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- b) has been seen by infrared light and spacecraft.
- c) is warmed by a greenhouse effect.
- d) has oceans of liquid gas (methane and ethane).
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## What shape are moons?

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- b) large ones are spherical, small ones irregular
- c) small ones are spherical, large ones are irregular
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Why can icy moons be geologically active when a planet the same size would be "dead?"

- a) Planets are older, so they have already cooled off.
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Why do Jupiter, Saturn, Uranus, and Neptune all have rings?

- a) They were left over from solar system formation.
- b) They all captured particles.
- c) All four planets had a large moon that disintegrated.
- d) All have small moons and orbiting particles that constantly collide and make rings.

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Saturn's average density is less than water's. Suppose Saturn were placed on a much larger planet made entirely of water. What would happen?

- a) It would float.
- b) It would sink to the center of the water planet.
- c) It would be spread out due to the rotation of the water planet.
- d) It would merge into the water planet; denser materials sinking toward the core and lighter materials forming part of the atmosphere.
- e) There would be a devastating impact and Saturn would be torn apart to form a giant ring system around the water planet.

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Surprising discovery? - Saturn's core is pockmarked with impact craters and dotted with volcanoes erupting basaltic lava.

- a) Plausible. Saturn's moons also show impact craters and volcanoes.
- b) Plausible. Saturn's atmosphere originated from the volatiles in impactors that were released via volcanic activity.
- c) Implausible. No impactors would survive the immense pressures at the depth of Saturn's core.
- d) Implausible. Any large impactor approaching Saturn would be broken up by tidal forces.
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Surprising discovery? - A jovian planet in another star system is found to have a moon as big as Mars.

- a) Plausible. There is no reason why jovian planets cannot have such large moons.
- b) Plausible. Jupiter itself has several moons as large as Mars.
- c) Plausible. Astronomers have already found large planets and moons around other star systems.
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Surprising discovery? - A new moon is found orbiting Neptune in its equatorial plane and in the same direction as Neptune rotates, but its made almost entirely of metals such as iron and nickel.

- a) Plausible. At these large distances from the Sun, the moon could have a high metal content.
- b) Plausible. The moon could be a captured asteroid.
- c) Plausible. The moon could be a captured Oort cloud object.
- d) Implausible. Solid objects at those distances are largely icy and rocky.
- e) Implausible. Such a dense object would not last long before falling into Neptune.

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